GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Bachelor of Technology					Branch/Spec.	Biomedical Engineering		
Semester	VII					Version	1.0.0.1		
Effective from Academic Year	2025-26					Effective for the Batch admitted in	July 2022		
Course Code	2BM7205		Course Name			Embedded System Design			
Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	1	-	4	Theory	40	60	100
Hours	3	-	2	-	5	Practical	30	20	50

Pre-requisites
Basic knowledge of Digital and Analog Electronics.

Course Outcomes	
On successful completion of the course, the students will be able to:	
CO1	**Understand** embedded system concepts to design and implement basic systems.
CO2	**Analyze** the differences in performance and resource utilization between PIC, MSP430, and ARM-based systems in real-time applications.
CO3	**Understand & Analyze** basic communication protocols .
CO4	**Create** embedded **Applications** by programming and interfacing various devices with PIC, MSP430, and ARM processors.
CO5	**Design** and **develop** hardware and software solutions to solve complex problems using modern embedded development tools and techniques.

Theory Syllabus		
Unit	Content	Hrs.
1	INTRODUCTION TO EMBEDDED SYSTEM: Definition, Embedded hardware units and devices, Embedded software, Design metrics in Embedded System, Challenges in Embedded System, Application in real world, Software Readability, Software Maintainability, Study of basic communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB (v2.0), Bluetooth, Zig-Bee, Wireless sensor network	10
2	ARCHITECTURE OF PIC MICROCONTROLLER: PIC18F Family, The Architecture of PIC family, PIC18F instructions, PIC18F programming model, Instruction format, Interrupts and Timers of PIC, I/O Port and Interfacing, Pin Configuration of PIC, Memory Paging, Addressing modes	8
3	REAL WORLD INTERFACING OF PIC MICROCONTROLLER: Interfacing of A to D and D to A converter, Stepper motor, LCD, Sensors and keyboard.	8
4	INTRODUCTION TO ARM PROCESSOR: Introduction, RISC features, ARM programmers model, ARM related Companies and its Opportunities, ARM processor family, Application of ARM Processor, Compiler, Emulation and Debugging, Introduction to LPC2148.	11
5	INTRODUCTION OF DSP PROCESSOR: MSP430 Microcontroller family, Hardware user interface, MSP430 Board, Software introduction, Application of DSP Processor.	8

Practical content:
Practical are based on above syllabus.

Text Books

1	Advanced PIC Microcontroller Projects in C: From USB to RTOS with the PIC" By Dogan Ibrahim, Pub: Neunes
2	ARM System-on-Chip Architecture" 2nd edition by Steve Furber, Pub: Pearson
3	MSP430 Microcontroller Basics" by John H. Davies, Pub: Neunes
Reference Books	
1	Introduction to Embedded Systems : Shibu K. V. (TMH)
2	Embedded System design : S. Heath (Elsevier)
3	Pic Microcontroller And Embedded Systems: Using Assembly and C for Pic18" by Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey, Pub: Neunes
4	Prof Steve Furber , "ARM System on Chip architecture", Addison Wesley; 2 edition (17 August 2000)
5	UM10139–lpc214x User manual
ICT/MOOCs Reference	
1	https://archive.nptel.ac.in/courses/106/105/106105193/
2	https://onlinecourses.nptel.ac.in/noc21_cs09/preview
3	https://nptel.ac.in/courses/108102045
4	https://onlinecourses.nptel.ac.in/noc24_cs33/preview
5	https://www.youtube.com/watch?v=uFhDGagZzjs
6	https://www.youtube.com/watch?v=AW-8gSWpH8Y

Mapping of CO with PO and PSO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	2	1	0	0	0	2	0	2	3	2	2
CO2	3	3	2	2	3	1	0	0	0	2	0	2	2	3	3
CO3	3	2	2	3	3	1	0	0	0	2	0	1	1	3	3
CO4	3	3	3	3	3	1	0	0	2	3	2	2	2	3	3
CO5	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3